OTTAWA December 24th, 1941.

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REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1134.

Gold Recovery from the Cobalt-Nickel Ore from the H. Shakt Mine, Township of Goleman, Trout Lake Area, Ontario.

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BUREAU OF MINES
DIVISION OF METALLIC MINERALS
ORE DRESSING AND
METALLURGICAL LABORATORIES



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ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1134.

Gold Recovery from the Cobalt-Nickel Ore from the H. Shakt Mine, Township of Coleman, Trout Lake Area, Ontario.

STREET SECTION SECTIONS AND SECTION SE

Shipment:

On November 29th, 1940, a shipment of cobaltnickel ore was received from the H. Shakt mine for concentration tests. The results of this investigation were covered in
our Report of Investigation No. 947, dated January 17th, 1941.

Purpose of the Present Investigation:

On November 20th, 1941, a request was received from J. M. Forbes, Consulting Mining Engineer, Montreal, Quebec,

(Purpose of the Present Investigation, cont'd) -

asking that additional tests be made to determine what recovery of gold could be made from the concentrates prior to shipment.

Investigation Procedure:

Several amalgamation tests were made on the flotation concentrate remaining from the previous investigation.

The remaining portion of the shipment was used to make several new tests. These included jigging, barrel amalgamation, flotation, table concentration, and plate amalgamation.

The remaining portion of the ore was re-sampled and was found to contain 0.86 ounce gold per ton.

Results:

Microscopic examination of the concentrate shows that it contains considerable free gold.

Approximately 30 per cent of the gold in the crewas recovered by amalgamation.

19 per cent of the gold in the ore was recovered when the flotation concentrate was amalgamated.

The results indicate that the gold in the sulphides was not freed at the grind used.

DETAILS OF TESTS:

Tests Nos. 1, 2, and 3. - Amalgamation of Flotation Concentrate,

The concentrate recovered in Test No. 1, Investigation No. 947, was used for these tests.

Three portions were reground in ball mills with lime, sodium hydroxide, and potassium dichromate respectively. The pulp was then barrel-amalgamated with 10 per cent by

(Tests Nos. 1, 2, and 3, cont'd) - weight of mercury.

The mercury and amalgam was separated and the three tailings were examined microscopically to determine whether any floured mercury or free gold could be seen.

Neither was observed. The mercury appeared clean and bright.

Resul	. 6	3 (1	NA PORTO ESTANDA PARA PORTO ANTO ANTO PORTO PARA PARA PARA PARA PARA PARA PARA PAR	ert et besommilieben bereitenber		· "我们是我们的人,我们们们就是什么,我们们就是我们的人,我们就会不会会不过,我们就是我们的人,我们就会会会不过。"	
	9	A	ssay,	9	Recovery of g	old, : Remarks	
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No.	5	Feed	:Tailing	s:In Tes	t:In Original	Feede: lb./ton	sone.
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3	p e	1.58	1,36	13.9	10,8	Potassium	
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The gold recovered in the flotation concentrate was 77.2 per cent of the gold in the feed, and only 24.1 per cent of this was recovered by amalgamating the flotation concentrate.

It is apparent that only the free gold in the concentrate was recovered by amalgamation. Microscopic examination did not disclose gold in the amalgamated concentrates.

Test No. 4. - Plate Amalgamation of Floration Concentrate.

This test was made to determine the recovery of gold by plate amalgamation of the flotation concentrate.

The flotation concentrate was made from the ore following the procedure used in Test No. 2, Investigation No. 947.

The concentrate was sampled and divided into two portions, one of which was washed with a solution of sodium hydroxide (5.0 pounds of NaOH per ton of concentrate).

The two portions of flotation concentrate were

(Test No. 4, contid) -

then plate amalgamated.

Results:

		Flotat	:1.0	m,			00418/18/A/A	A STEERING OF STREET, SALES OF STREET, S
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Feed	e u	3.00.0		0,86		100.0		
Concentrate	5	52.0		1.51		91.6		1.9:1.
Middling	Ų	13.1		0.34		5,2		
Tailing	# 3	34.9		0.08		3,2		
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4 - A	1.51	1.30	13.9		12.	7		NaOH - Wash
4-B	1,51	1,36	9,9		9.	<u>į</u>		E RYZNI SEZINA GWYATHANÎ

This test indicates that only the free gold can be recovered on the plate.

The plate did not appear to be adversely affected by this type of feed.

The recovery of gold by flotation was lower than that obtained in the previous investigation. The original tests were made on freshly crushed ore. The remaining portion of the ore used in that investigation has become oxidized, which is probably the cause of the lower recovery.

Test No. 5. - Plate Amalgamation of the Ore Prior to Flotation.

This test was made to determine the recovery of gold by plate amalgamation of the ore.

The ore was ground 90 per cent minus 200 mesh and passed over an amalgamation plate. The plate tailing was

(Test No. 5, cont'd) -

filtered, sampled, and then repulped in a flotation machine,

Reagents:

Conditioning agents -

- 3.0 pounds of soda ash per ton,
- 0.5 pound coal tar creosote per ton.

The pulp was agitated for 20 minutes.

Added:

- 0.4 pound amyl xanthate per ton.
- O.l pound pine oil per ton.

Flotation time, 4 minutes.

Added:

- 1.0 pound copper sulphate per tom.
- 2.0 pounds sods ash per ton.
- 0.6 pound amyl xanthate per ton (In stages).

Flotation time, 22 minutes.

pH of pulp at beginning of flotation - 9.7. pH of pulp at end of flotation - 9.0.

Total time of flotation, 26 minutes.

Results:

Plate Amalga	amation of Ore.
Assays,	; Recovery
Au oz./ton	s of gold,
Feed : Tailing	: per cent
o Exercisite descriptions de la constant de la cons	द्रामहरूपस्यातः १४५० व्यापारम् स्थानिक स्थानसम्बद्धानाम् यसम्पर्धारस्य स्थानसम्बद्धानाम् । स्थानसम्बद्धानसम्बद्धानाम् ।
0.86: 0.59	31.4
q d or or or other control of the co	ara ara sana ara a a a a a a a a a a a a a a a a

Flotation of Amalgamation Tailings. Weight,: Assay, :Distribution of gold, : Ratio of : Au ; per cent : soz./ton : In Test: In Original Feed: concen-Product per ; drieo tration 68,6 Feed : 100.0 0.59 100.0 57.9 2.1:1. 46.8 1.07 84.4 Concentrate : 18,1 8,3 4:1. Middling 0.28 25.0 0.075 2.4 3,5 28.2 Tailing

(Continued on next page)

(Test No. 5, cont'd) -

This test indicates that 31 per cent of the gold in the ore can be recovered by amalgamation.

Summary of the Test:

trica transcenses mitra est di chemica, des assession est consecuente de comunit.		Per cent
Recovery of gold as amalgam on plate	=	31.4
11000 0043 FC W W	=	57.9
Gold remaining in flotation middling and tailing	utup	10,77
Total	æ	100.0 Per cent

Test No. 6. - Jig Concentration of the Ore; Amalgametion of the Jig Concentrate; and Flotation of the Jig Tailing.

This test was made to determine the recovery of gold by jisging the feed and amalgamating the jig concentrate.

A sample of the ore was ground 90 per cent minus 200 mesh and passed through a mineral jig. The jig concentrate was examined microscopically and barrel-amalgamated.

The amalgam and amalgamated concentrate were assayed.

The jig tailing was filtered, sampled, and repulped in a flotation machine. A flotation concentrate was recovered as in Test No. 5.

Results:

Jig Concentration.										
CALIFIC TERRESOLVE TALE CALIFORNIA PROPERTY OF THE CONTRACT OF	Q D	Weight,	,	Assay,	0	Distribution	6	Ratio of		
Product	9	per	o n	Au	9	of gold,	9	concen-		
	0	cont	3	oz./ton	0	per cent	ă Çı	tration		
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Feed [©]	0	1.00.0		0,89		100.0				
Jig concentrate	٥	7.1		5.01		39,9		14.0:1.		
Jig tailing	e O	92,9		0.58		60.1				
ANTER SECURENCE AN ARRESTORANTE AND A VARIABLE DA MARKETAN DE SECURENCE DE LA COMPANSIONA DEL COMPANSIONA DE LA COMPANSIONA DEL COMPANSIONA DE LA COMPANSION	o o	an a vellen fartne kurtur ar.	Januar Januar	ndrokkerd and bewatters	e e e e e e e e e e e e e e e e e e e	elitini ilimunyinin yamay karatarania, kan ta sama ara 1970 -	er er in in	eur regels and enterenteur europe appearation en arte 1 Ma		

 $^{^{} ilde{\Phi}}$. The feed assay was calculated from the products.

(Continued on next page)

(Test No. 6, cont'd) -

	Amelge	mation	of Jig	Concentrate	•
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Product	0	per	: Au	e per	CONT
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Feed	9	7.1	5.01		39,9
Amalgam	G 0	az#	3.71	. 74.1	29.5
Amalgamated co	nc.;	(PB)	1.30	25.9	10.4
Compression and the Charles of the Control of the C	C D	· SECTION OF THE SECTION SECTI	CTIVE FINE IN ACTUAL AC	andres is such as the such and the such and the such as the such a	TO WHILE SAILS BOARD OF SECOND COMP IN SHAPE SHE SAIL STORES TO SECOND S

PRODUCT BUTTON OF ANALYSIS OF THE STATE OF T		Flotatio	n of Jig			
, , , , , , , , , , , , , , , , , , , ,	: We	ight,	: Assays	, :Distribu	ition of	:Ratio of
Product	Selection of the second	cent	g: Au	ments transminer of march	oer cont	. concen-
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Feed	*100 O	09.0	0.58	100.0	60 T	
Concentrate	:100,0 : 49,2	92,9 45,7	1.08	100.0 91.8	60.1 55.2	Z.O:l.
Middling	: 16.9	15.7	0.16	4.7	8,8	5,9:1.
Tailing	; 33,9	31.5	0.06	3 ° 5	2.1	42 0 es 3 tor 0
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Summary of the Test;		Por cont
Gold recovered as bullion in amalgam	(=)	29.5
Gold in amalgamated concentrate	F ±7	10.4
Gold in flotation concentrate	en en	55 .2
Gold in flotation middling and tailing	₹©	Octoberania de Maria Mar
Total	429	100.0 Per cent

The jig concentrate contained considerable free gold. Lime was used in the barrel-amalgamation (10 pound lime per ton of concentrate); no floured mercury was seen in the amalgamated concentrate.

In practice the amalgamation concentrate would be returned to the ball mill or to the classifier to recover the remaining values by flotation; or, if the grade is sufficiently high, it can be added directly to the final concentrate.

In this test, 7 per cent of the feed was barrelamalgamated instead of approximately 50 per cent when the (Test No. 6, contid) -

whole flotation concentrate requires amalgamation.

Test No. 7. - Flotation followed by Table Concentrate; tration of the Flotation Concentrate; Amalgamation of the Table Concentrate.

This test was made to determine the recovery of gold by amalgamating a table concentrate recovered from a flotation concentrate in order to avoid amalgamating a large bulk of flotation concentrate.

A sample of the ore was ground 90 per cent minus 200 mesh and floated similarly to Tests Nos. 5 and 6.

The flotation concentrate was then concentrated on a Wilfley table.

The table concentrate was reground with 10 pounds of NaOH per ton and barrel-amalgamated.

Results:

•		Flot	ation of	the Orc.	A Designation of the control of the
THE ADJUSTED CONTROL OF HER CANNESS AND EXTREMENDATIONS AND REMAINS AND SECTION ASSECTATION AND REMAINS FOR A MARKET TO A MARK.	Ć.	Weight,	: Assay,	Distributio	n: Ratio of
Product		$\mathbf{be}x$: Au	of gold,	: concen-
englandrav enga tilizit. Viza i ez ne'nry y Ari'- na acza e z 1021 n. 2000 da.	p di	cent	oz /ton	·	tration
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Feed. [®]	13	100.0	0.73	100.0	
Flot. concentrate	9	51.3	1,30	90.8	1,95:1.
Flot, middling	tt tt	12.6	0.19	3,3	7.9:1.
Flot, tailing	9 5	36.l	0.12	5,9	
ናቸጃቸውር። ሙቀል ያገርያቸው፤ አርነገር የተመረሰር ነገር የሚያስመውን የሚያስ ቀቀል አለውን አልተገኝ ያለገር ነገር ነገር ነገር ነገር ነገር ነገር ነገር ነገር ነገር ነ	ernanda Š	our regard, from years for the super grant table for the super research in the Land to the grant from the contents with years for the super fo	en kartin ett variande stal kon foreste kan einste sykkolo en sykkolo en kartin ett variande stal kon foreste kan inn 100 k mannta kenne en sykkol	en e	አቀልል አስባለያ ያገ 173 ያቸጣ የመጀመርያ ምሳ የነፃሩ ትርምያ ነ መንግስት መንግስት የተስለ የነፃነር የመጀመርያ የመንግስት የነፃነር የመጀመርያ የአስባለ የነፃነር የመንግስት የነፃነር መመር የነፃነር የነፃ

The feed assay was calculated from the products.

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Product	; per	cent	: Au	: gold,	per cent	: concen=
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Feed	:100.0	51,3	1.30	0,001	90.8	
Table conc.	: 19.0	9.7	2,95	45.0	39.1	5.3:1.
Table middling	: 33.3	17.1.	1.02	26.1	23.7	3,0;1,
Table tailing	, 47.7	24.5	0.84	30.9	28.0	
<u></u>	o a		the second state of the second	. ಹುಳ ಎಟ್ಟರ ಬಸಲಾಗುತ್ತಮ ಕಿ.ಇ.13 ಟ್ರ್ಯಾ ಹಾಗೂ ಕರ್ನಾರ್ಯ ಪ್ರೇಕ್ಷ್ ಗ	erden ett. E. 2 med 1873 og 1941 state til 1870 som vett skritet i 1880 state til	er og en er

(Test No. 7, contid) -

Barrel-Amelgan				
			: Distrib	
Products	: A		: Gold	
and the state of t			:In test:I	n orig. feed
		0.00	3.00.0	51.0
Feed	ä	2,95	100,0	39 . l
Amalgam	ő	1.45	49.2	19.2
Amalgamated conc.	0	1.50	50.8	19;9
e ser water file) i e koke see weet i not depo en met da n'eur e travelante som oak n'eur e	o o o	CHARLEST COLUMNICATION	a latercal fraction and the constitution and the second	en ware ampointerance of Lygical expension and applicable

Summary of the Test:

n ar Andrews Pall, Francis at 9 a 1800 a 18 a 18 a 18 a 18 a 18 a 18 a	and cantillate with in the few of Calculating recovery 1955 to a		Per cent
Gold	recovered as bullion in amalgam	బు	19.2
Gold	in amalgamated concentrate	e.	19.9
Gold	in table middling and tailing	n.s	51.7
Gold	in flotation middling and tailing	~	9.2
	Total	en .	loo.o Per cent

No floured mercury or free gold could be seen under the microscope when the smalgamated concentrate was examined.

The mercury appeared clean and bright and was recovered without difficulty.

Summary:

Amalgamation of the flotation concentrate gave recoveries/from 10 to 19 per cent of the gold in the feed.

Plate amalgamation of the ore prior to flotation gave a recovery of 31 per cent of the gold in the feed.

Amalgamation of a jig concentrate gave a recovery of 29.5 per cent of the gold in the feed as bullion.

Conclusions:

Due to the low ratio of concentration the flotation concentrate recovered from this ore is very bulky and would result in having to treat approximately 50 per cent of the weight of the feed by barrel-emalgamation.

In order to overcome this difficulty and recover the free gold it is suggested that a mineral jig be inserted in the ball mill-classifier circuit to recover the gold before it reaches the classifier or the flotation circuit. This will produce a high ratio of concentration and the feed to the amalgam barrel will be less bulky.

The amalgamated jig concentrate should then be returned to the classifier or if the grade is sufficiently high it could be added directly to the final concentrate.

The gold liberated from the gangue and metallic mineral will be recovered by amalgamation. The gold included in the dense metallic minerals cannot be recovered by amalgamation but would report in the cobalt-nickel concentrates.

WSJ:GHB.